

1 Implementation: Specialized Value Objects

GeoAPI package:	<i>all coverage packages</i>
GeoTools package:	<i>all coverage packages</i>
Implementor:	<i>Your Name Here (change text style to "Table Contents" when entered.)</i>
Specified Implementation Classes:	●
Specified Interface Classes:	●

A value object is the means by which an interpolated coverage calculates a Record of values at the specified position given the sampled data maintained by the coverage. ISO 19123 provides a specialization of CV_ValueObject for every defined specialization of CV_ContinuousCoverage. These specialized value objects encapsulate the code which makes assumptions about the structure of the coverage's data.

In a manner very similar to the type narrowing of domain objects, the defined value objects have a geometry parameter which has been constrained to a purely spatial expression. This is summarized in Figure 1. When purely spatial coverages are considered, this represents no loss of functionality, although the expression is somewhat awkward as the overridden type is unrelated to the inherited type.

However, when spatio-temporal coverages are considered, the meaning of the objects in Figure 1 is somewhat ambiguous. Are all objects available to participate in the interpolation regardless of their associated time? Shall the coverage interpolate only among objects which occur within a certain time window, or at a specified instant in time? How is the time window (or instant) of interest communicated to the interpolator object? The resolution of this ambiguity is the topic of this implementation work unit.

The objects defined by ISO19123 shall be refashioned into spatio-temporal interpolator objects prior to implementation. The implementations specified in this IWUG shall cover the case of purely spatial interpolation. All of the coverage's objects shall be considered to occur simultaneously. The specified interpolation point shall be considered to be simultaneous with all the objects in the coverage. Time is essentially factored out of these implementations.

The purpose of this reformulation, however, is to later allow users to write spatio-temporal interpolators using these definitions.

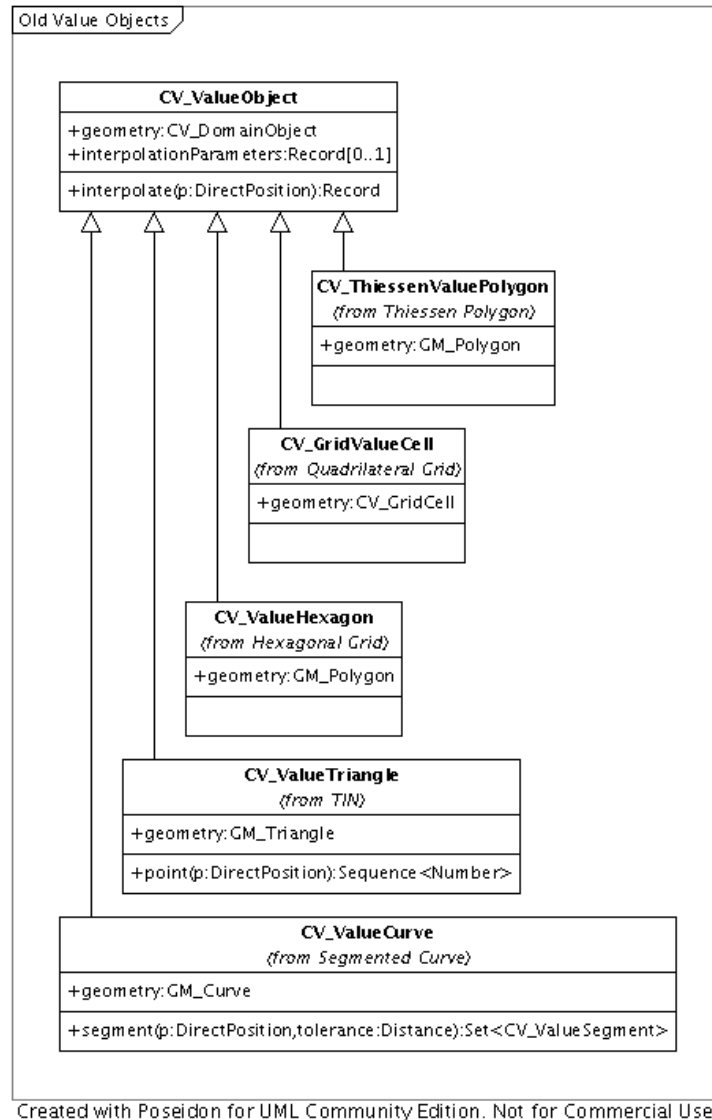
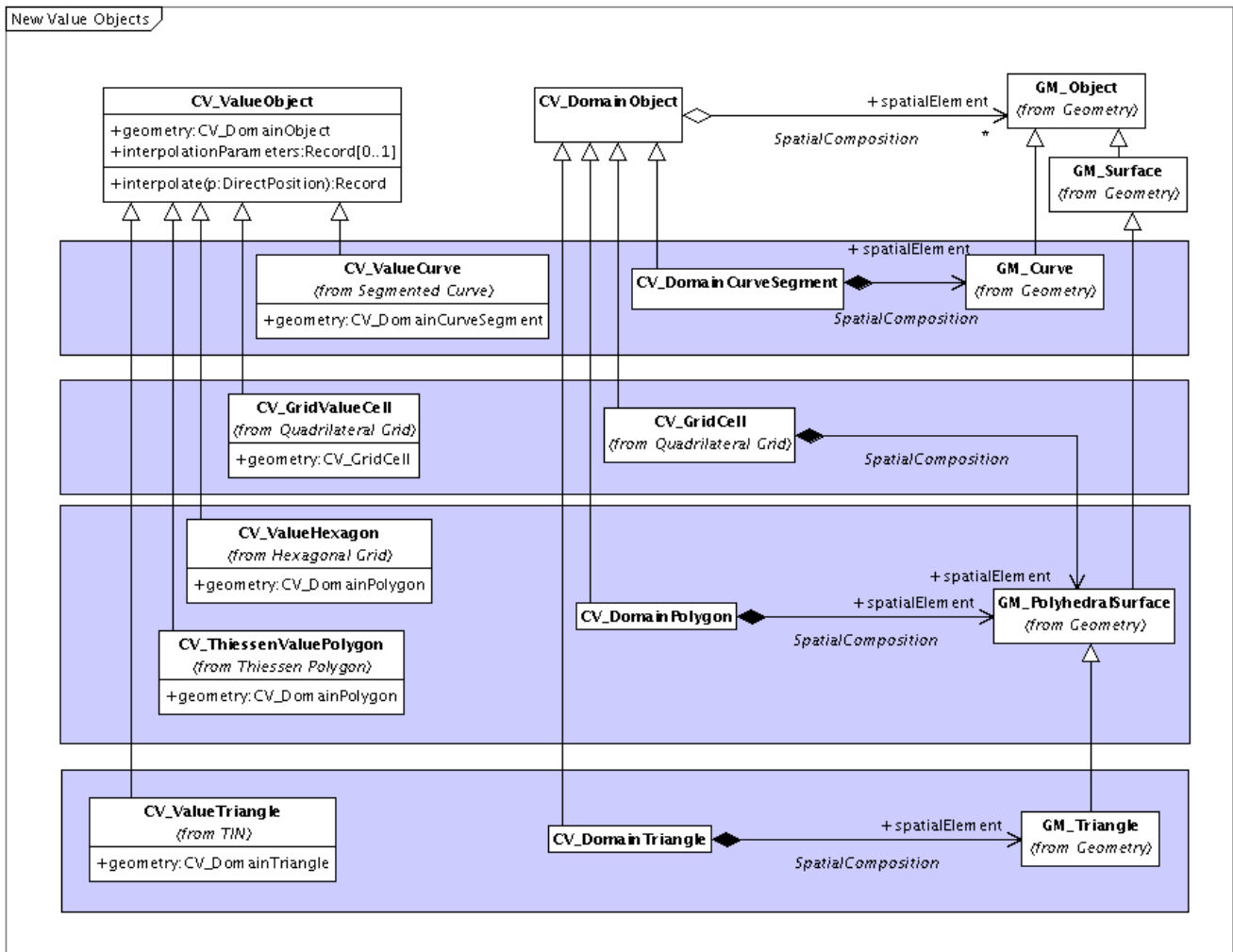


Figure 1: ISO 19123 Specification of value objects.

1.1 Departure from ISO 19123

The classes depicted in Figure 1 have been reformulated as shown in Figure 2. This reformulation is based on the premise that the authors of ISO 19123 intended to perform type narrowing on the geometry attribute with each specialization of the CV_ValueObject class. Accordingly, the corresponding CV_DomainXXX types have been created to define specializations of CV_DomainObject.

These specializations are different than the those created in the “Specialized Domain Objects” section. ISO 19123, in this case, did not use subclasses of GM_Object. Rather, it referenced single building blocks for those component objects (e.g., GM_Triangle and GM_Polygon instead of GM_PolyhedralSurface and GM_TriangulatedSurface). This reformulation is further predicated on the belief that the authors of ISO 19123 intended to restrict each interpolator object to a single constituent element of a GM_Object.



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Figure 2: Reformulated Value Objects, adapted from ISO 19123.

The following restrictions may be found in Figure 2:

1. The specialized domain objects impose a requirement on the type of the SpatialComposition association.
2. All specialized domain objects limit the multiplicity of the SpatialComposition association to one.
3. All specialized domain objects further require that the child of GM_Object associated to the class by the SpatialComposition association contain only one component (e.g., one triangle, one polygon, one curve segment, etc.)

Due to these restrictions, the children of CV_DomainObject are more closely bound to the constructs of the Geometry package than is CV_DomainObject itself. This is indicated in Figure 2 by the solid composition diamond.

In the reformulation, there is a clear association of interpolator object with the single data object which backs it. This data object has a simple relationship with the domain object upon which the parent is based, from which it inherits the ability to specify the temporal instant or window over which the data are valid. The implementation

objects specified in this IWUG restrict the inherited TemporalComposition to a multiplicity of one, but future implementations of any of these CV_ValueObject children may be capable of interpolating along a temporal axis as well.

1.2 GeoAPI Interface Diagram

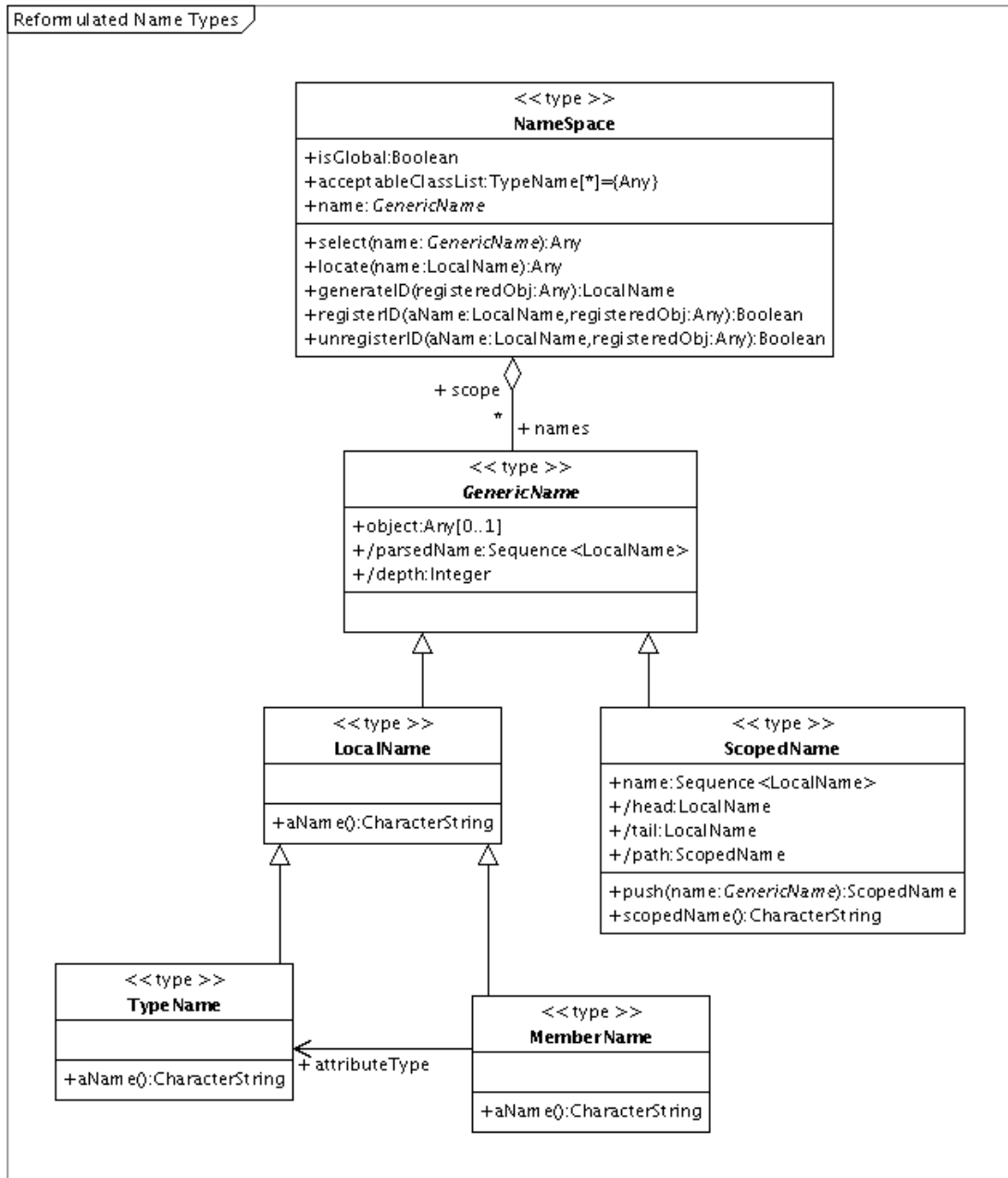


Figure 3: GeoAPI Interfaces for Specialized Value Objects.

1.3 Implementation Design

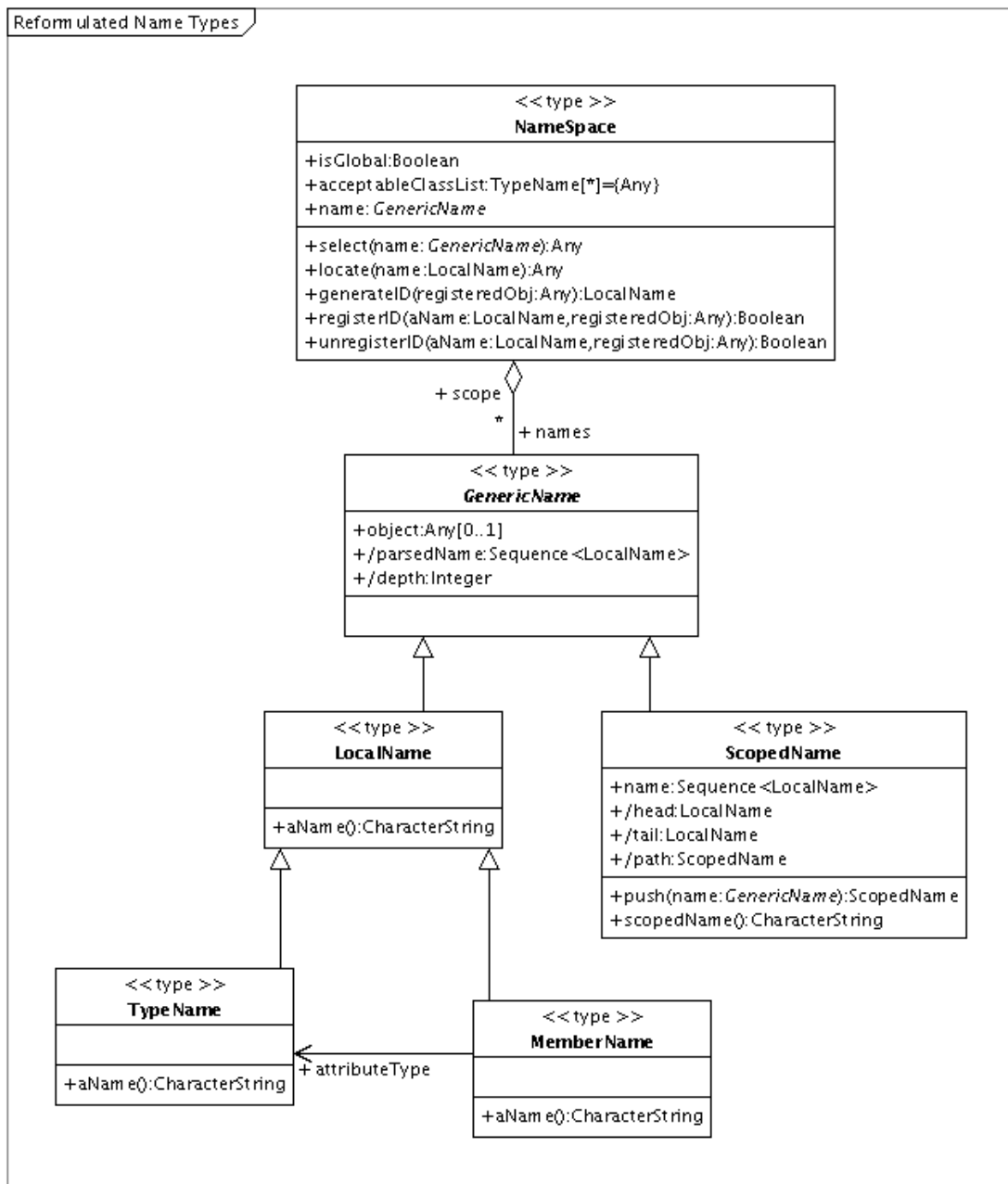


Figure 4: Implementation design for Specialized Value Objects.

1.4 Detailed Discussion

1.5 Modeling Pre-work

1.5.1 Classification of GeoAPI methods

TODO: Use the following spreadsheet object to classify the GeoAPI methods. Double-click the spreadsheet (and not the frame) to edit.

GeoAPI Package: org.opengis.xxx

GeoAPI Class/Interface:

Method	Classification (A, R, O)	Type
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Table 1: GeoAPI Method Classification for Specialized Value Objects.

1.5.2 Interface and Data Type Proxies

TODO: Use the following spreadsheet object to list the Interface and Data Type proxies required for this implementation effort.

GeoAPI Package:

Interface Proxies	Data Type Proxies
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Table 2: Proxy types for Specialized Value Objects

1.6 Test cases

TODO: Describe potential test cases and indicate whether they have been implemented...

<i>Name</i>	<i>Done?</i>	<i>Description</i>
	y/n	

Table 3: Potential Test Cases for Specialized Value Objects

